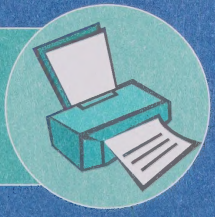
ENERGY STAR®

Guide to an Energy-Smart Office



ENERGY STAR
HIGH EFFICIENCY
HAUTE EFFICACITÉ

Natural Resources Canada
Ressources naturelles Canada

Canada

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1 Introduction

The hum of computers, printers, photocopiers and other equipment may be a sign of a busy, prosperous office, but it can also be an indication that some of the company's profits are being eaten up by needless use of energy. Whether you operate one computer or 1000, wasted energy is wasted money. It also creates unnecessary atmospheric emissions, including greenhouse gases that are contributing to climate change.

This booklet is designed to help office managers and equipment purchasers and users reduce the amount of electricity consumed in Canadian offices without sacrificing equipment functionality, performance, ease of use or reliability. It provides practical advice on how we can get the most out of the machines that help us do our jobs, at the least cost and with the minimum impact on the environment.

Selecting the right equipment to achieve these goals is simple – once you have determined your performance requirements, just look for machines that bear the ENERGY STAR® symbol. ENERGY STAR is fast becoming an internationally recognized symbol for energy efficiency, and dozens of manufacturers are now producing office equipment that meets the program's strict technical

specifications. Natural Resources Canada's Office of Energy Efficiency promotes and monitors the international ENERGY STAR symbol in Canada. The symbol identifies the products that use less energy, thereby helping you save money and protect the environment. Office equipment that qualifies for the ENERGY STAR symbol is often no more expensive to purchase than conventional equipment, but it is guaranteed to be among the most energy efficient on the market. In short, the ENERGY STAR symbol is a great tool to help you manage your utility bills.

The *ENERGY STAR® Guide to an Energy-Smart Office* could help your company or organization save hundreds or even thousands of dollars in utility costs each year. That is good for your bottom line, good for Canada's economy and good for our environment. Read on to learn more about how wise purchase decisions and good operating practices can contribute to an energy-smart office.

2 ENERGY STAR® and Office Equipment

If you are interested in saving money and helping the environment, you can take a giant step in the right direction by selecting ENERGY STAR qualified products when buying new office equipment.

ENERGY STAR is the symbol for energy efficiency. To qualify for the ENERGY STAR symbol, products must meet strict technical specifications designed to ensure that they are among the most energy efficient on the market.

Figure 1: The ENERGY STAR Symbol

The familiar ENERGY STAR symbol appears on a wide range of products sold in Canada.

The power of the ENERGY STAR symbol is its simplicity – the technical evaluation has been done for you to determine which products are the most energy efficient. If you buy ENERGY STAR labelled equipment, you can rest assured you are getting a product that is at the top of its class in energy performance – and the less energy a product consumes, the more it helps to protect our environment by reducing greenhouse gas (GHG) emissions that contribute to climate change.

In Canada, ENERGY STAR is administered by Natural Resources Canada's Office of Energy Efficiency, which enrols participating manufacturers and promotes and monitors the use of the ENERGY STAR symbol on office equipment and other products.[1] ENERGY STAR in Canada includes the following types of office equipment:

- personal computers
- monitors
- printers
- fax machines
- scanners
- photocopiers
- multi-function devices

To find a qualifying model, simply look for the ENERGY STAR symbol on the product itself, on the product packaging or in the product literature. Visit the Web site at **energystar.gc.ca** for the most current list of participating manufacturers and qualified products.

How Much Can You Save With ENERGY STAR?

The amount of money you will save by purchasing ENERGY STAR qualified products will depend on several factors, including the size of your office (the number of employees and the amount of equipment you use); the equipment-using habits of employees; the level of employee awareness and commitment to communicating electronically; and local utility rates.

[1] ENERGY STAR also includes appliances, residential heating and cooling equipment, consumer electronics, lighting and signage. More information is available at the ENERGY STAR Web site at **energystar.gc.ca.**

Figure 2 provides a comparison of ENERGY STAR qualified equipment and conventional equipment in a typical office of 200 employees. The figure shows how much money an office like this could expect to save under normal operating conditions, as well as the potential savings in GHG emissions. These cost calculations are based on an average electricity rate of $0.10/kWh. You can do your own

Figure 2: Comparison of ENERGY STAR Qualified Equipment and Conventional Office Equipment in a Hypothetical Office (200 Employees)

Type of Equipment*	Annual Energy Costs for ENERGY STAR Qualified Equipment ($)▲	Annual Energy Costs for Conventional Equipment ($)	Annual Energy Cost Savings by Using ENERGY STAR Qualified Equipment ($)
Personal Computers/ Monitors (180)	3,587	6,464	2,877
Laser Printers (18)	249	573	324
Fax Machines (9)	87	163	76
High-speed Photocopiers (6)	751	813	62
Scanners (6)	64	216	152
Total	**$4,738**	**$8,229**	**$3,491**

**The cost premium for all types of ENERGY STAR labelled equipment compared with conventional equipment is $0.*

▲Calculations were based on $0.10/kWh.

calculations based on average electricity rates in your province using the handy ENERGY STAR Simple Savings Calculator, which is available on-line at **energystar.gc.ca**.

Keep in mind that ENERGY STAR labelled equipment typically costs no more to purchase than conventional equipment with the same operating features and capacity.

Lifetime Energy Cost Savings by Using ENERGY STAR Qualified Equipment ($)†	Lifetime Energy Savings by Using ENERGY STAR Qualified Equipment (kW/h)	Lifetime GHG Savings by Using ENERGY STAR Qualified Equipment (kg of carbon dioxide equivalent)
9,122	114 999	62 329
1,413	19 444	10 539
287	3 778	2 048
272	3 746	2 030
482	6 082	3 297
$11,576	**148 049 kW/h**	**80 243 kg of CO_2e**

†Assumed product lifetime is 4 years for personal computers/monitors, 6 years for laser printers, 5 years for fax machines, 6 years for high-speed copiers, and 4 years for scanners.

Other Benefits

The economic and environmental benefits of buying ENERGY STAR qualified office equipment are clear, but here are two more points to consider:

- ENERGY STAR labelled equipment produces less heat by powering down when not in use. This feature contributes to a cooler, more comfortable workspace and can save on air-conditioning costs.
- Heat can cause equipment failure. ENERGY STAR labelled equipment may last longer because it generates less heat.

The following sections of this booklet provide information on the ENERGY STAR specifications for different types of office equipment. Information is also provided on different features and technologies that affect office equipment energy consumption. Keep in mind that *all office equipment must be shipped from the factory with the power management capabilities fully activated in order to qualify for the ENERGY STAR symbol.*

3 Personal Computers and Monitors

In a typical office, computer/monitor combinations far outweigh all other office equipment in terms of energy consumption. The good news is that this offers significant opportunities to achieve energy savings by purchasing ENERGY STAR qualified machines and encouraging employees to turn them off when not in use.

ENERGY STAR Specifications

To qualify for the ENERGY STAR symbol:

- Computers must have the capacity to automatically switch into a low-power "sleep" mode, where the unit consumes no more than 30 watts of power after a preset period of inactivity.
- Monitors must have two low-power sleep modes, first reducing energy use to no more than 15 watts after 15 to 30 minutes of inactivity, and then switching to a "deep sleep" mode of 8 watts or less after being inactive for a cumulative period of 70 minutes.

Features of an Energy-efficient Computer

Energy Efficiency Gains for Desktop Units

Significant improvements have been made in the energy efficiency of desktop personal computers (PCs) over the past decade, thanks in large part to the migration of energy-efficient features from the world of laptops to desktop machines.

The most important of these features is the power management capability that places the computer and monitor in sleep mode when they are not being used. While in this mode, computers consume up to 90 percent less electricity than when fully operational, although they are available essentially on demand (i.e. the system does not have to be rebooted). A simple touch of any key on the keyboard or movement of the mouse is enough to bring computers out of their sleep mode. This power management capability is mandatory for a computer to meet the ENERGY STAR technical specifications.

Monitor Options

The type of display technology you choose for a computer system has an important impact on energy consumption.

For desktop computers, the most common displays are cathode ray tubes (CRTs), which typically consume about half as much electricity as the computer itself. CRTs consume significantly more energy than liquid crystal display (LCD) monitors. As well, colour monitors consume more electricity than monochrome units. CRT electricity

requirements also increase in conjunction with display size and resolution.

Flat screen display technologies, which originated in laptop computers but are becoming popular in desktop applications, consume only about one-third the energy of a CRT. Flat screen monitors offer excellent resolution (particularly LCD models) and are much thinner than conventional monitors, which means they occupy less space on your desk. However, they can be more expensive to purchase than CRT monitors of comparable size.

Whichever technology you select, make sure it has a power management feature that will automatically switch the monitor into sleep mode (and preferably a deep sleep mode) after a preset period of inactivity (remember, this is mandatory to bear the ENERGY STAR symbol).

Laptops Are Energy Efficiency Winners

The most energy-efficient computer/monitor combination is a laptop unit. Laptops use a maximum of 15 watts (compared with 80 to 160 watts for desktop PCs) and automatically power down (go into sleep mode) after several minutes of inactivity.

However, their lower energy consumption does not necessarily mean that laptops will save you money in the long term. Laptops are usually more expensive to purchase than comparable desktop units. The cost and inconvenience of recharging and eventually replacing batteries must be considered. In addition, laptops generally have inferior

displays and do not offer the full range of features available in desktop units.

Still, laptops can be ideal for certain applications, inside and outside the office. When purchasing a laptop, compare the integrated or advanced power management features of different models. Although they are likely quite similar, some models may have additional energy-saving features.

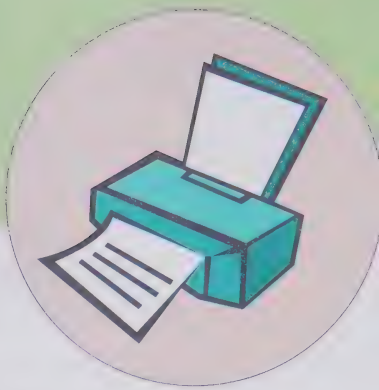
Making the Right Choice

When purchasing a new computer and monitor, it is important to match your needs. Although the addition of unnecessary hardware will likely increase a PC's energy requirements, you will want to ensure that the machine gives you the functionality needed for the tasks you want to perform (whether at work or at home). Keep the following points in mind:

- As a rule, the faster the processor speed, the more energy the machine will use.
- The larger the memory (RAM), the greater the energy consumption.
- The addition of extra "boards" or components (e.g. CD writers) will likely increase the system's energy requirements.
- Nameplate power ratings can provide a useful but imprecise comparison of energy use (due to the lack of common measurement standards).

- From an energy efficiency perspective, in order of efficiency are the
  - LCD monochrome backlit monitor (consumes 2 to 5 percent of the electricity of a colour CRT)
  - LCD flat screen monitor (consumes 10 to 20 percent of the electricity of a colour CRT)
  - monochrome CRT monitor (consumes 50 to 65 percent of the electricity of a colour CRT)
- Screen savers do not save energy: they protect screen phosphors (in fact, some screen savers are so complex they increase energy consumption).
- Consider purchasing upgradable machines so you can install bigger hard drives or new microprocessors as your needs change, rather than purchasing an entirely new computer.

4 Printers



As already noted, one of the best ways to create an energy-smart office is to reduce your use of paper and printing/imaging technologies. However, even the most energy-conscious and environmentally friendly office will not be able to completely eliminate the need for printing technologies, at least for the foreseeable future. That makes it doubly important to select the right printer or combination of printers in the first place, since different technologies offer wide variations in performance and energy consumption.

The most common printing technologies in use today are laser printers, inkjet printers, and dot matrix and daisy wheel printers.

ENERGY STAR Specifications

To qualify for the ENERGY STAR symbol, printers must automatically enter a low-power mode of 10 to 75 watts or less, depending on the size and capacity (pages per minute output) of the unit, after a period of inactivity.

Making the Right Choice

Matching your needs with the most appropriate printing technologies and capabilities will help reduce your office's energy consumption. If you do not require the highest quality or speed, for example, you may not need a printer that uses light and heat in its imaging process – lasers and colour inkjet machines. A regular inkjet printer is an excellent alternative, as it produces near-laser quality (but at a slower speed) and uses less energy. For printing draft documents, a dot matrix or impact printer does the job at much less cost than a laser.

When purchasing a printer, look for a model that has an energy-saver feature that significantly reduces the machine's energy consumption in standby mode. This is important, since printers are often idle for long periods but continue to consume energy unless manually turned off. Although a short delay will occur before a print job begins from standby mode, this minor inconvenience is more than offset through energy savings.

It can also be worthwhile to compare nameplate power ratings. Although this is not a precise method of comparison, the large differences in power requirements for certain models can provide a yardstick for measuring relative energy efficiency. Keep in mind that although faster printers have a higher overall energy requirement, they consume less energy per page when printing large volumes.

When comparing power ratings, it is a good idea to estimate the workload of the printer (i.e. the length of time it will be printing as opposed to sitting idle). In offices with a heavy printing load, more emphasis should be placed on the machine's power rating during the printing operation. If the printer will sit idle for long periods, its power rating in the idle or energy-saver mode may be more important. Ask the vendor for information on energy consumption during all operating modes – printing, idling and energy-saver – and take these figures into account when making your purchase decision.

As well, consider a printer that has the capability to print on both sides of the paper. This reduces direct paper costs and the energy use associated with paper production.

5 Fax Machines and Scanners

Fax machines continue to be an important tool for receiving and transmitting information in many offices. A range of technologies are available, including laser, inkjet and thermal.

Desktop scanners provide the technological link required to move text, photographs and graphics from paper to an electronic format, where they can be more efficiently edited, manipulated, distributed and stored.

ENERGY STAR Specifications

To qualify for the ENERGY STAR symbol:

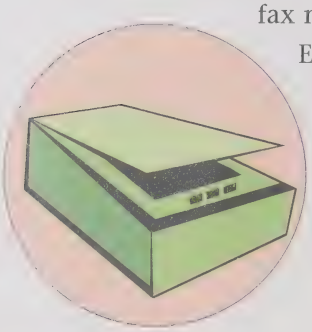
- Fax machines must automatically enter a low-power mode of 10 to 15 watts or less after a period of inactivity, depending on page-per-minute output.
- Scanners must automatically power down to 12 watts or less after a period of inactivity.

Making the Right Choice

Energy consumption by fax machines is generally measured in four distinct modes: standby, transmitting, receiving and copying. For most machines, electricity requirements may be similar during the transmitting, receiving and copying modes, and significantly reduced in the standby mode.

Because there are no standardized test procedures for determining the energy consumption of fax machines, comparisons of power ratings do not always provide accurate results. Nevertheless, due to extreme differences in the amount of energy consumed by different printing/imaging technologies and by different machines within the same technology group, comparisons can be useful. In the case of laser machines, for example, an inefficient fax can use as much as 50 percent more energy than an efficient machine.

When purchasing a fax machine or scanner, look for a machine with a standby mode that offers low energy consumption and, preferably, an energy-saver feature. Power management capabilities are mandatory for a fax machine or scanner to meet the ENERGY STAR technical specifications.



6 Photocopiers

Photocopiers are by far the most energy-intensive type of office machine. Photocopying technologies include

- Analog: heat and pressure fusing, in which a high-temperature tungsten-halogen exposure lamp is used to affix toner to paper
- Laser: surface fusing, which is similar to heat and pressure fusing but uses smaller fusers that are heated only as needed
- Inkjet: ink is sprayed onto paper to match a digital image. These are primarily small multi-function printer/copier machines.

ENERGY STAR Specifications

To qualify for the ENERGY STAR symbol, photocopiers must go into a low-power mode and then an off mode of 5 to 20 watts after 30 to 90 minutes of inactivity, depending on the copier's speed.

Making the Right Choice

Heat and pressure fusing is the most common photocopying technology, especially for high-quality and high-volume copying. However, it also consumes the most energy. Other photocopying technologies may be suitable for less demanding needs and certainly will consume less energy (particularly inkjet systems).

Different machines using the same technology may have substantially different energy requirements. But, unlike those on computers, printers and fax machines, the power ratings on photocopiers do provide an accurate means of comparing energy consumption.

Photocopier modes include

- standby mode, which is essential for maintaining certain electronic components when the machine is shut off
- warm-up mode, a short period when the fuser is being made ready for printing
- printing mode
- idling mode, which is the normal state when sitting unused for extended periods
- energy-saver mode, which is reached after a preset period of idling (inactivity)

However, energy requirements should not be the only consideration when selecting a photocopier. Rather, energy consumption during the work day should also be estimated

and evaluated on a per-copy basis. Although high-quality or high-speed photocopying usually requires more electricity, the top-end machines may be able to provide this service using less energy per copy than a smaller machine. For this reason, you should ask the vendor to include electricity consumption in the per-copy cost comparison. This can help you match your needs with the most productive machine for the job.

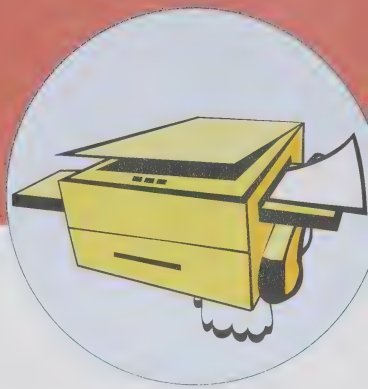
When purchasing a new photocopier, make sure it is equipped with an energy-saver feature. This power management capability is mandatory for a copier to meet the ENERGY STAR technical specifications. Electricity consumption in the energy-saver mode should be at least 50 percent less than in idle mode.

Other features to look for include

- Automatic duplexing – the feature that allows for two-sided copying. Since this feature does not reduce actual printing volume, it does not directly save energy, toner or wear and tear on the machine. However, it does significantly reduce paper consumption, which saves you money and helps the environment by reducing the amount of energy and fibre (trees) used for paper production.
- Copy-size reduction. Large originals can be reduced and reprinted on smaller paper. The end result is that less paper and energy are used.

- Pre-programming. This feature allows frequently used settings to be stored in the photocopier for quick and accurate re-use. This can minimize the number of wasted copies that may be made as users adjust the settings to produce their desired output.
- Capability to send large documents from a workstation to the photocopier. Many new photocopiers are connected to a central server. Sending documents to a photocopier to make multiple copies saves energy.

7 Multi-function Devices



Multi-function devices combine printer, photocopier, scanner and fax technology in a single machine. In so doing, they reduce idle energy costs (only one machine is running, rather than four) and space requirements. They also reduce capital costs, since you will be purchasing one machine instead of four.

ENERGY STAR Specifications

To qualify for the ENERGY STAR symbol, multi-function devices must automatically power down to no more than 25 to 105 watts after a period of inactivity, depending on the device's speed.

Making the Right Choice

When purchasing a multi-function device, make sure it is equipped with an energy-saver feature. Electricity consumption in the energy-saver mode should be at least 50 percent less than in idle mode.

8 Using Office Equipment Wisely

Buying ENERGY STAR qualified equipment is a sure way to reduce your office's energy consumption and greenhouse gas emissions. But it doesn't begin and end there – as noted earlier, how office equipment is used is also important. This section of the booklet provides some tips on how to get the most out of your equipment at the least energy and environmental cost.

Planning

As a starting point, review the extent to which your office uses overnight operations. Are your computers backed up in the middle of the night, and could this be done just as easily during normal business hours? Do you receive fax messages during off-hours; if not, does your fax machine need to be turned on at these times, or could you install a call-activated switching device? Can you reduce the number of hours during the night in which office machines must be running?

Educating Staff

Strong staff commitment and participation are essential to any efforts to reduce energy consumption across the office. Consider launching an awareness and promotional effort to make staff aware of the issues, opportunities and actions

needed to achieve energy savings. A well-organized initiative with a credible message and management buy-in stands a good chance of being successful. Keep it simple, perhaps beginning with only one or two initiatives. It could be as basic as designating an individual in each work unit to shut off the photocopier at day's end.

Use the Equipment Properly

- Encourage staff to turn off equipment manually when it is not in use. Offering incentives or rewards is one way to capture employees' attention and encourage compliance with this policy.
- If your computers and software have power management capabilities, make sure employees are fully aware of how to configure their PCs for energy savings while meeting performance requirements.
- Ensure that timers and other intelligent switching devices are properly installed and are being used consistently and effectively.
- Make sure intelligent switching devices are programmed to minimize inconvenience and frustration for the user. Dissatisfied users may eventually turn off these devices.

- Remind your staff that frequently switching equipment on and off will not damage the components.
- Make sure employees are aware that screen savers are not an energy-saving feature. If screen savers are used,

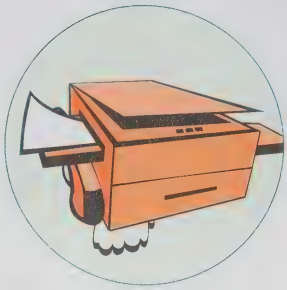
the monitor should be set to display images for only a short period before entering sleep mode.

- If you have a choice of printers, avoid using a laser printer for draft-quality printouts. From an energy efficiency perspective, the order of preference should be inkjet, dot matrix and laser printers.
- Unless top quality is needed, use a cold fuser photocopier when available, rather than a heat and pressure fusing machine.
- When any piece of office equipment has an energy-saver mode, make sure it is operating. Machines that do not bear the ENERGY STAR symbol are often shipped with this feature disabled.
- Photocopiers are highly mechanical devices. If they are not running properly, energy consumption will increase and other problems may arise. Ensure that a preventive maintenance program is in place to adequately service your photocopier(s) and other machines.

Minimize Printing Requirements and Use Paper Wisely

- If you have the tools to generate, communicate and store information electronically, use them!
- Discourage policies or impulses to automatically recopy thermal-paper fax messages onto plain paper. You are effectively paying double the printing costs.
- Copy on both sides of the paper. Although this takes more time, double-sided printing reduces paper costs, saves filing space and minimizes the amount of energy and fibre required for paper production.

- Attach a circulation slip to documents instead of making additional copies.
- Re-use paper within your office for draft printouts and note taking. Inkjet printers, copiers, fax machines and dot matrix printers all handle used paper. Laser printer manufacturers recommend against re-using paper, due to possible jamming and damaging of the fuser mechanism.



- Recycle used paper. Besides the environmental benefits (less waste to landfills and reduced paper requirements), recycling may reduce your waste disposal fees.
- Purchase and use recycled paper when possible. For many applications, unbleached recycled paper is an increasingly acceptable alternative to bleached papers. Whether you use bleached or unbleached paper, purchasing recycled stock helps to ensure the best use of limited resources.

Recycle Computers and Peripherals

In an energy-smart office, the commitment to recycling will extend beyond paper to include computers and peripherals.

When it is time to update any type of office equipment, do not simply throw the old machines into the trash. Try to arrange a trade-in with the manufacturer or dealer from whom you are purchasing new equipment. Alternatively, local schools and community groups may welcome a donation of a used computer, printer, fax machine, copier or scanner. Another option is to check the Yellow Pages™ to find a broker who will buy used equipment or to identify recycling facilities in your area.

Take the One-Tonne Challenge, a national effort to take action on climate change.

Improving energy efficiency reduces greenhouse gas (GHG) emissions that contribute to climate change.

By using energy efficiently and making wise consumer choices, you can reduce your individual GHG emissions by one tonne, or about 20%. Like most Canadians, you probably already take steps to conserve resources and protect the environment. Now the One-Tonne Challenge calls on you to make a bigger commitment. Find out more, visit the following Web site: climatechange.gc.ca.

9 For More Information

Natural Resources Canada's (NRCan's) Office of Energy Efficiency (OEE) has many free publications that will help you understand how to save energy at home, at work and on the road. At the same time, you will be saving money and helping the environment.

For more information on the ENERGY STAR® international symbol or tips on energy-efficient products, visit OEE Web sites at **oee.nrcan.gc.ca** and **energystar.gc.ca**.

To receive publications, please write or call

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Notes

Natural Resources Canada's Office of Energy Efficiency

Leading Canadians to Energy Efficiency at Home, at Work and on the Road

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